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EFFECT OF IRRIGATION WITH MIXED WATER INTERVALS AND NITROGEN FERTILIZATION RATES ON TECHNOLOGICAL CHARACTERS OF EGYPTIAN COTTON (VARIETY GIZA 83)

By

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ABSTRACT: Two field experiments were carried out at Kom Oshem, El-Fayom governorate during 2001 and 2002 seasons ,to study the effect of irrigation intervals with mixed water (Nile water +drainage water by 50%)and nitrogen fertilization rates on technological characters of egyption cotton variety Giza 83 irrigation intervals were 8,10,12,14 and 16 days. Nitrogen fertilization rates were 25,50,75,and 90kg N/feddan. The obtained results showed that average fiber fineness(micronair reading), fiber length at 25% span length, uniformity ratio%, fiber strength and fiber elongation% were significantly affected by irrigation intervals and nitrogen fertilization rates was achieved in both seasons. The highest fiber length at 2.5% span length with irrigated every 10 days and fertilization with 75kg N/feddan.

Micrnaire reading increased with shorter irrigation intervals from 16 days to 8 days. The differences between 10 to 16 days did not reach the level of significance. Application nitrogen fertilization at the rate 75kg N/feddan gave the highest micronaire reading. While, cotton plants fertilized with 25kg N\feddan gave the lowest micronaire reading in both seasons . results clearly that irrigation every 8 or 10 days have the highest uniformity ratio %. Mean while the minimum values to this character were obtained by irrigation every 12,14 or 16 days in both seasons, while the lowest valves to this characters were by 25kg N\feddan. Results clearly also that irrigation every 8 or 10 days followed by irrigation every 12 days gave the highest fiber strength. On the other hand, irrigation every 16 days gave the lowest fiber strength in the first and second seasons, that application nitrogen fertilization by rate 75kgN\ feddan gave the highest values, while, rate 25kgN\feddan gave the lowest value. Results indicated that, irrigation every 12 days gave the maximum fiber elongation compared with other irrigation intervals while irrigation every 16 days gave the minimum values in tow seasons. Application nitrogen fertilization at the rate 75kg N\feddan gave the highest fiber elongation, mean while, use rate 25kg N\feddan an recorded the lowest values.

INTRODUCTION

Cotton is the most important fiber crop in the world in Egypt, the whole textile industry in depends upon adequate water supply is an essential need for normal plant growth and development and to obtained better yield and quality. Now days in Egypt greet efforts were done to bridge the gab between water requirements and water consumptions one of these attempts is reuse drainage water in irrigation by mixed it with Nile water. All effects should be continued to improve and rates of nitrogen fertilization under this conditions Abdel-Al and Syiam(1990), Ismail et al (1990), Mustafa et al (1990), Salwa etal(1990), Abdel-Rahim and Eid, (1993) El-Kholy (1993), Ahmed (1994), El-Kashlan (1997), Saeed (2000), Xiao et al (2000), Pamo et al (2001),and Enciso et al (2003), indicated that irrigation treatments have not exerted any significant effect on fiber length , fineness, fiber strength, uniformity ratio and fiber elongation, while irrigation with saline water or drainge water decreased fiber quality. El-Shinnaw et al (1984), El-Zaree (1985), Sawan ((1986) and Ebelhar et al (1994) found that increasing nitrogen rates significantly increased lint properties.

MATERIALS AND METHODS

Tow field experiments were carried out to El-Fayoum Governorate, Tamiya, Kom Oshem during 2001 and 2002 seasons to study the effect of irrigation intervals using mixed water (Nile water + drainage water by 50 %) and nitrogen fertilization rates on technological of Egyptian cotton variety Giza 83.

The studied irrigation intervals were 8, 10, 12, 14 and 16 days. The water in irrigation was Nile water mixed with 50% drainage water. The chemical analysis of mixed water irrigation is shown in Table (1).

Table (1): Chemical analysis of mixed water which used in irrigation

Season	E.Cm mohs/cm	pH	Meq/L								p.p.m			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	Co_3^{-}	Hco_3^{-}	$So4^{--}$	Cl^{-}	Fe	Mn	Zn	Cu
2001	2.80	7.57	2.37	2.73	2.9	0.34	0.00	3.77	3.87	8.47	0.13	0.006	0.08	0.09
2002	3.07	7.81	2.88	3.79	8.07	0.31	0.00	3.93	4.21	8.83	0.15	0.005	0.11	0.08

The tested nitrogen fertilization rates were 25, 50, 75 and 90 kg N/feddan (4200 m^2). Nitrogen fertilization at the previously rates was applied in the from of Urea 46.5 %). The rates of nitrogen were applied in two equal doses, the first dose applied before the second irrigation and the second was applied after 30 days from application the first dose. The experiments were layed out in split plot design with four replications. The main plots were assigned to irrigation intervals, where the sub plots were assigned to nitrogen fertilization rates. The sub plot area 25.2 m^2 (six rows x 0.6 m width x 7m long).

The experiment soil was prepared as usual and phosphorus fertilization was prior to seed bed preparation at the rate of 100 kg sulfur phosphate 15.5 % P_4O_5) per feddan. The soil texture at the experimental site is clay shown in Table (2).

Table (2): Mechanical and chemical soil analysis (depth 0 – 50 cm) of experimental site at E-Fayoum in 2001 and 2002 seasons.

1- Soil mechanical analysis:

seasons	Paricle size distribution analysis			Soil texture
	Sand %	Silt %	Clay %	
2001	29.	18.0	53.0	Clay
2002	24.4	23.0	52.6	Clay

2- Chemical analysis:

Season	pH	E.C	$Caco_3$%	O.m%	Micronutrients mg/100g						Micronutrients p.p.m				Meq./L		
					N	P	K	Mg	Na	Ca	Fe	Mn	Zn	Cu	Cl	So4	Hco_3
2001	8.65	3.41	5.20	0.80	24.6	0.65	61.5	139.4	92.7	297.3	12.5	6.16	2.15	1.64	17.3	16.2	3.50
2002	8.8	4.22	3.44	1.06	21.8	1.20	57.8	145.8	97.9	288.4	14.8	7.20	2.60	2.40	18.7	14.9	2.30

On 15th March and 19th March seeds were hand sown in hills spaced 25 cm part on both sides of ridge in 2001 and 2002 seasons, respectively. The plants were thinning leaving two plants per hill before the second irrigation.

The studied cotton variety:

Giza 83 is, a long staple Egyptian cotton variety developed from the cross (Giza 72 x Giza 67). This variety characterized by a lint length around 31 mm, highly yielding ability, high lint percentage (38.39 %)

and early maturing. It is commercial variety, released in 1988 in middle Egypt.

The studied characters:

Samples of seed cotton were collected from each treatment and the following data were measured.

1- Fiber fineness (micronaire reading):

The determination of micronaire reading of loses cotton fiber was done by measuring the resistance of a plug of cotton fibers to air flow under prescribed conditions by using "fibronaire". The micronaire instrument gave an estimate of fineness and maturity in combination (A.S.T.M.. Designation. D – 1448, 1947). The fiber maturity tester (F.M.T.). expressed as a percentage according to A.S.T.M.. D- 381 – 79.

2- Fiber length 2.5 % span length:

The fiber length was measured using "Digital fibrograph" according to A.S.T.M. designation: D – 1447 – 77. The 2.5 % span length and mean length were determined from the instrument (used in the routing work of the C.A.T.G.O. lobaroratories).

3- Uniformity ratio %:

The uniformity ratio was also calculated as mean length divided by 2.5 % span length and multiplying the ratio by 100 to convert it into a percentage uniformity ratio.

$$\text{Uniformity ratio \%} = \frac{50\%S.L}{2.5\%S.L} \times 100$$

4- Fiber strength:

This test covers the determination of the tensile strength or breaking tenacity and the elongation at the breaking load of cotton fibers as flat bundle with 1/8" in gauge by using the stelometer according to ASTM designation: D- 1445 – 75. a bundle of fiber is combed paralled in clamps. cut to a known length, broken in the tensile testing machine and weighed. The breaking tenacity G/tex is determined according to the following equation.

Breaking tenacity= Breaking load in kg f x 15 / Bundle massing mg.

5- Fiber elongation:

Breaking elongation was obtained directly from the percentage elongation scale by using the stelometer (obvious method).

Statistical analysis:

All data were subjected to statistical analysis as split design according to procedures outlined by Snedecor and Cochran (1982). Treatments were compared by leas significant difference (L.S.D) at 5 % probability.

RESULTS AND DISCUSSION

A)- EFFECT IRRIGATION INTERVALS:

1- Fiber fineness (Micronaire reading):

Results presented in Table (3) and (4) show clearly that irrigation intervals had a significant effect on micronaire reading of Egyptian cotton variety Giza 83 in 2001 and 2002 seasons. Irrigation every 8 days gave the significant highest micronaire reading, 4.30 and 4.72 compared irrigation every 16 days gave the lowest micronaire reading 4.05 and 4.12 in 2001 and 2002 seasons, respectively. The obtained results may be due to that under water stress conditions, especially during secondary wall formation, cell sap concentrations become higher and the cell osmotic pressure increase. The leaves in this case have higher levels of suction force, which led to physiological stress performance of plants. These resylts are in agreement with those of Ismail et al (19890), Abdel-Rahim and Eid (1993), El-Kholy (1993), Ahmed (1994), El-Kashlan (1997) and Saeed (2000).

Table (3): Effect of irrigation intervals and nitrogen fertilization on micronaire reading of Egyptian cotton variety Giza 83 in 2001 season.

Nitrogen fertilization rates (kg N/fed.)	Irrigation intervals (days)					Mean
	8	10	12	14	16	
25	4.20	4.20	4.10	4.10	4.00	4.12
50	4.20	4.20	4.10	4.10	4.10	4.14
75	4.90	4.40	4.40	4.30	4.20	4.38
90	4.30	4.10	4.30	4.10	4.10	4.18
Mean	4.40	4.22	4.22	4.15	4.01	
L.S.D. a 0.05 for						
Irrigation (I)	0.21					
Nitrogen (N)	0.15					
I x N	0.30					

Table (4): Effect of irrigation intervals and nitrogen fertilization on micronaire reading of Egyptian cotton variety Giza 83 in 2002 season.

Nitrogen fertilization rates (kg N/fed.)	Irrigation intervals (days)					Mean
	8	10	12	14	16	
25	4.30	4.20	4.20	4.20	4.10	4.20
50	4.40	4.30	4.25	4.10	4.10	4.23
75	5.50	4.40	4.30	4.20	4.20	4.52
90	4.70	4.30	4.20	4.10	4.10	4.28
Mean	4.72	4.30	4.18	4.15	4.12	
L.S.D. a 0.05 for						
Irrigation (I)	0.21					
Nitrogen (N)	0.16					
I x N	0.35					

2- Fiber length at 2.5 % span length (mm):

Results recorded in Tables (5 and 6) showed that irrigation every 8 or 10 days gave the highest fiber length at 2.5 % span length, while, irrigation every 12, 14 or 16 days gave lowest values fiber length at 2.5 % span length. The previous results are agreement with those obtained by Ahmed (1994), El-Kashlan (1997) and saeed (2000). The obtained results

Table (5): Effect of irrigation intervals and nitrogen fertilization on fiber length at 2.5 of Egyptian cotton variety Giza 83 in 2001 season.

Nitrogen fertilization rates (kg N/fed.)	Irrigation intervals (days)					Mean
	8	10	12	14	16	
25	30.30	30.30	30.20	30.10	30.00	30.18
50	30.30	31.30	30.17	30.15	30.13	30.41
75	31.50	31.70	30.20	30.20	30.20	30.76
90	30.20	30.20	30.20	30.10	30.10	30.16
Mean	30.57	30.85	30.19	30.13	30.10	
L.S.D. a 0.05 for						
Irrigation (I)	0.19					
Nitrogen (N)	0.36					
I x N	0.80					

may be due to plants under water stress conditions especially during primary wall formation cell sap concentrations become higher and cell

osmotic pressure increases. The leaves can obsorb water from young bolls, the leaves in this case has higher levels of suction force and then caused fiber short.

Table (6): Effect of irrigation intervals and nitrogen fertilization on fiber length at 2.5 % span length of Egyptian cotton variety Giza 83 in 2002 season.

Nitrogen fertilization rates (kg N/fed.)	Irrigation intervals (days)					Mean
	8	10	12	14	16	
25	30.40	30.40	30.10	30.00	29.90	30.16
50	30.50	30.60	30.30	30.20	30.00	30.32
75	31.60	31.80	30.50	30.30	30.10	30.86
90	30.70	30.70	30.30	30.20	30.20	30.42
Mean	30.80	30.83	30.87	30.17	30.05	
L.S.D. a 0.05 for						
Irrigation (I)	0.62					
Nitrogen (N)	0.64					
I x N	1.44					

3- Uniformity ratio %:

Results presented in Tables (7 and 8) show clearly that irrigation 8 or 10 days have the highest uniformity ratio %. Meanwhile, the minimum values to this character were obtained by irrigation cotton plants 12, 14 or 16 days in the two seasons. The previous results are agreement with Xiao et al (2000), Palomo et al (2001) and Enciso et al (2003). The reduction in uniformity ratio % caused bu increasing irrigation intervals might be attributed to the shortage in water irrigation led to unregulated in cotton growth and fiber length was affected so short fiber percentage increased.

4- Fiber strength (g/tex):

Results recorded in Tables (9 and 10) clearly that irrigation every 12 days followed by irrigation every 10 or 8 days gave the highest fiber strength. On the other hand, the irrigation every 16 or 14 days gave the lowest fiber strength in the first and second seasons. These results are in harmony with Sala et al (1991). The obtained results may be due to that plants under water stress conditions cell sap concentrations become

higher and the cell osmotic pressure increase, which led to physiological stress performance of plants.

Table (7): Effect of irrigation intervals and nitrogen fertilization on uniformity ratio % of Egyptian cotton variety Giza 83 in 2001 season.

Nitrogen fertilization rates (kg N/fed.)	Irrigation intervals (days)					Mean
	8	10	12	14	16	
25	85.40	85.50	85.30	85.20	85.15	85.31
50	85.50	85.61	85.40	85.30	85.17	85.39
75	85.60	86.40	85.50	85.31	85.20	85.60
90	85.50	86.00	85.40	85.30	85.10	85.46
Mean	85.50	85.87	85.40	85.27	85.15	
L.S.D. a 0.05 for						
Irrigation (I)	0.31					
Nitrogen (N)	0.27					
I x N	1.06					

Table (8): Effect of irrigation intervals and nitrogen fertilization on uniformity ratio % of Egyptian cotton variety Giza 83 in 2002 season.

Nitrogen fertilization rates (kg N/fed.)	Irrigation intervals (days)					Mean
	8	10	12	14	16	
25	85.30	85.40	85.30	85.20	85.17	85.27
50	85.40	85.50	85.40	85.20	85.20	85.34
75	85.30	86.30	85.60	85.30	85.20	85.54
90	85.20	85.70	85.30	85.20	85.20	85.32
Mean	85.30	85.72	85.40	85.22	85.19	
L.S.D. a 0.05 for						
Irrigation (I)	0.25					
Nitrogen (N)	0.20					
I x N	0.51					

5- Fiber elongation %:

Results in Tables (11 and 12) indicated that, the irrigation every 12 days gave the maximum fiber elongation 6.30 and 6.5 % compared with other irrigation intervals. While, the irrigation every 16 days gave the

minimum values (5.76 and 6.15 %) in 2001 and 2002 seasons, respectively. These results are in harmony with Salwau et al (1991).

Table (9): Effect of irrigation intervals and nitrogen fertilization on fiber strength (g/tex) of Egyptian cotton variety Giza 83 in 2001 season.

Nitrogen fertilization rates (kg N/fed.)	Irrigation intervals (days)					Mean
	8	10	12	14	16	
25	31.30	31.40	32.30	31.50	31.20	31.54
50	32.20	32.30	32.60	31.70	31.40	32.04
75	33.00	33.10	33.50	32.00	32.00	32.72
90	32.10	32.20	32.60	32.00	32.00	32.18
Mean	32.15	32.25	32.75	31.80	31.65	
L.S.D. a 0.05 for						
Irrigation (I)	0.18					
Nitrogen (N)	0.25					
I x N	1.57					

Table (10): Effect of irrigation intervals and nitrogen fertilization on micronaire reading of Egyptian cotton variety Giza 83 in 2002 season.

Nitrogen fertilization rates (kg N/fed.)	Irrigation intervals (days)					Mean
	8	10	12	14	16	
25	31.60	29.90	35.20	34.70	27.80	31.84
50	32.70	33.70	35.00	35.70	31.50	33.72
75	34.40	37.30	37.30	31.90	31.10	34.40
90	30.90	32.80	33.50	31.80	32.30	32.26
Mean	32.40	33.42	35.25	33.52	30.67	
L.S.D. a 0.05 for						
Irrigation (I)	0.25					
Nitrogen (N)	0.19					
I x N	1.43					

Table (11): Effect of irrigation intervals and nitrogen fertilization on fiber elongation % of Egyptian cotton variety Giza 83 in 2001 season.

Nitrogen fertilization rates (kg N/fed.)	Irrigation intervals (days)					Mean
	8	10	12	14	16	
25	5.80	5.80	6.00	5.70	5.50	5.76
50	6.00	6.10	6.30	6.20	6.10	6.17
75	6.30	6.40	6.50	6.20	6.10	6.30
90	6.30	6.20	6.40	6.10	6.10	6.22
Mean	6.10	6.12	6.30	6.05	5.95	
L.S.D. a 0.05 for						
Irrigation (I)	0.28					
Nitrogen (N)	0.15					
I x N	0.33					

Table (12): Effect of irrigation intervals and nitrogen fertilization on fiber elongation % of Egyptian cotton variety Giza 83 in 2002 season.

Nitrogen fertilization rates (kg N/fed.)	Irrigation intervals (days)					Mean
	8	10	12	14	16	
25	6.10	6.10	6.30	6.10	6.00	6.15
50	6.20	6.30	6.50	6.00	6.20	6.30
75	6.40	6.50	6.70	6.30	6.25	6.53
90	6.30	6.30	6.50	6.25	6.10	6.31
Mean	6.20	6.25	6.50	6.16	6.13	
L.S.D. a 0.05 for						
Irrigation (I)	0.25					
Nitrogen (N)	0.18					
I x N	0.40					

B- EFFECT OF NITROGEN FERTILIZATION:

Application nitrogen fertilization at the rate 75 kg N/feddan gave the highest micronaire reading 4.38 and 4.52. While, cotton plants fertilized with 25 kg N/feddan gave the lowest micronaire reading 4.12 and 4.20 in the both seasons, respectively. The lowest values of micronaire reading were recorded fertilizing cotton by 25, 50 or 90kg N/feddan. Those results were not in agreement with El-Shinnawy et al (1984), El-Zaree (1985), Sawan (1986) and Ebelhar et al (1994). The positive significant effect for nitrogen fertilization high rates may be due to increase growth and

development of vegetative tissues, increase regulation physiological processes.

Nitrogen fertilizer rate had significant effect on fiber length at 2.5 % span length (mm), uniformity ratio %, fiber strength (g/tex) and fiber elongation %. Application nitrogen fertilization at the rate of 75 kg N/feddan gave the highest values for studied characters. This values were 30.70 and 30.84 mm for fiber length, 85.60 and 85.58 % for uniformity ratio %, 32.72 and 33.98 (g/tex) for fiber strength and 6.66 and 6.51 % for fiber elongation in the two seasons, respectively. While, the lowest values to this characters were 30.17 and 30.16 mm, 85.31 and 85.27 %, 31.54 and 32.26 g/tex) and 6.24 and 6.14 % in the first and second seasons, respectively. The obtained results were from by 25 kg N/feddan in the first and second seasons for all characters. These results are not in harmony with those reported by Sawan (1986) and Ebhelhar et al (1994). The positive effect may be due to increase growth and development of vegetative tissues increase regulation physiological processes in case irrigation by mixed water.

C) EFFECT OF INTERACTIONS BETWEEN STUDIED FACTORS :

1- Fiber fineness (micronaire reading) and fiber strength:

Results tabulated in Tables (3 and 4) indicated that irrigation every 8, 10 or 12 days and fertilized with 75 kg N/feddan gave the highest values of microniare reading and fiber strength characters. While, irrigation every 16 days and fertilized with 25 or 90 kg N/feddan gave the lowest values compared with all other interactions in 2001 and 2002 seasons.

2- Fiber length and uniformity ratio:

With regard the interaction between irrigation intervals and nitrogen fertilization rates, results presented in Tables (5, 6, 7 and 8) revealed that, irrigation every 10 days with fertilized by 75 kg N/feddan recorded the maximum fiber length and uniformity ratio 31.7 and 31.8 mm, and 86.40 and 86.30 % in the first and second seasons, respectively. Meanwhile, irrigation every 16 days and fertilized with 25 kg N/feddan gave the minimum fiber length and uniformity ratio 30.00 and 29.9 mm, and 85.15 and 85.17 % in the both seasons, respectively. Obtained results may be due to effect nitrogen fertilization on diluted effect salinity presented in

irrigation water and soil.

3- Fiber strength and fiber elongation:

Results presented in Tables (9, 10, 11 and 12) indicated that interactions between irrigation every 12 days and fertilized with 75 kg N/feddan gave the highest fiber strength and fiber elongation 33.50 and 37.30 (g/tex) and, 6.50 and 6.70 % in 2001 and 2002 seasons, respectively. On the other hand, irrigation every 16 days with fertilized by 25 kg N/feddan recorded the minimum values 31.20 and 27.80 (g/tex) and, 5.50 and 5.80 % in the two seasons, respectively. Obtained results may be due to positive effect nitrogen fertilization on diluting negative effect to salinity presented in irrigation water and soil.

CONCLUSION

Finally, it could be concluded: the best treatment in the studied was the interaction between irrigation every 8 days at fiber fineness (micronaire reading), irrigation every 10 or 12 days with fertilized by 75 kg N/feddan with fiber length, uniformity ratio %, fiber strength and fiber elongation %.

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تأثير الرى بالمياه المخلوطة و التسميد الآزوتى على الصفات التكنولوجية للقطن المصرى

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الملخص العربى

اجريت هذه الدراسة بهدف دراسة تأثير الرى بالمياه المخلوطة بالصرف الزراعى و كذلك تأثير التسميد النيتروجينى على الصفات التكنولوجية فى الصنف المصرى جديزة ٨٣ وتمت زراعة التجربة فى موسمى الزراعة ٢٠٠١-٢٠٠٢ بمحافظة الفيوم – مركز طامية - كوم اوشيم ، وصممت التجربة فى قطع منشقة مرة واحدة فى اربع مكررات و كانت فترات الرى فى القطع الرئيسية و هى الرى كل ٨ ، ١٠ ، ١٢ ، ١٤ ، ١٦ يوم و التسميد الأزوتى فى القطع الشقية و كانت المعدلات ٢٥ ، ٥٠ ، ٧٥ ، ٩٠ كجم وحدة أزوت للفدان ، و كانت النتائج المتحصل عليها كالآتى:

١- أظهرت النتائج تأثيرا معنويا لفترات الرى على كل الصفات محل الدراسة و سجل الرى كل ٨ ايام فى موسمى الزراعة زيادة معنوية موجبة على صفة قراءة الميكرونير كمقياس لصفة النعومة ، كما سجل الرى كل ١٠ ايام تأثيرا معنويا موجبا على صفتى طول التيلة عند ٢,٥ % و نسبة الانتظام كنسبة منوية فى موسمى الزراعة ، وسجل الرى كل ١٢ يوم تأثيرا معنويا موجبا على صفتى متانة الخصلة (جرام/ تكس) واستطالة الشعرة كنسبة منوية.

٢- اوضحت النتائج تأثيرا معنويا للتسميد الآزوتى على كل الصفات المدروسة و ادت إضافة ٧٥ وحدة أزوت/ فدان الى زيادة معنوية موجبة على كل الصفات المدروسة.

٣- من خلال نتائج التفاعل الثنائى أوضحت النتائج ان الرى كل ٨ ايام مع التسميد ب ٧٥ وحدة ازوت/فدان أدى الى الحصول على أفضل نتيجة بالنسبة لقراءة الميكرونير ، وكانت أفضل نتيجة بالنسبة لصفتى طول التيلة و نسبة الانتظام عند معاملة الرى كل ١٠ ايام مع التسميد ب ٧٥ وحدة أزوت/فدان ، كما أوضحت النتائج ان الرى كل ١٢ يوم مع التسميد الأزوتى ب ٧٥ وحدة أزوت/فدان كان له تأثيرا معنويا موجبا على صفتى متانة الخصلة (جرام/تكس) واستطالة الشعرة كنسبة منوية.